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Recent Advances in connection with Swayback in Lambs, with Allied Disorders in Man and Animals and Experimental Demyelination Diseases

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INTRODUCTION

Studies of swayback in lambs developed in a curious way; much was established and known about the field aspect long before the nature of the disease was clearly defined. Some attention was given to it by workers in the Institute of Animal Pathology, Cambridge, shortly after the latter was founded in 1923. A full account of the investigations made in this Institute is given in the papers of Innes and Shearer (1940), Dunlop *et al.* (1939) and Shearer *et al.* (1941). These investigations partly clarified an ill-defined paralytic disease of lambs which in the past had caused severe losses, but it was realised that an understanding of this animal disease was important from the point of view of demyelination diseases in general, diseases which still constitute one of the most baffling problems confronting the neurologist. Swayback was the first disease of this type to be described in domestic animals which led at first to pessimistic hopes about any solution of its aetiology being obtained, as little progress had been made either in studies of demyelination diseases of man or in the experimental approaches adopted. There was little prospect of a solution of swayback being reached until the shrewd observations of Bennetts (1937) threw new light on the problem when he suggested that a copper deficiency was involved. Investigations, first in Australia and then in this country, showed that a prophylactic measure had been discovered against swayback, but there has been little progress since made towards a knowledge of the pathogenesis. There was thus an analogy with the introduction of liver therapy for pernicious anaemia in man which, as Boyd has said, "greatly widened the circle of light, but the margin of that circle still fades for ever as we move; step by step the fountain of mischief has been pushed back . . . but the problem remains."

The fact that a suitable prophylactic measure was discovered to combat swayback before the pathogenesis was better understood was perhaps unfortunate, for outbreaks of the disease may no longer occur and material for further study may not be available. Like many other enigmatic disease problems of both man and animals, it is unlikely that further advances will be made regarding swayback until an experimental approach is possible. As Weston Hurst (1942) has said, demyelination must be mediated by enzymatic processes and must ultimately be explained on a biochemical basis. If an experimental worker can find just how demyelination is brought about, then it is possible that he might be able to shed light on the spontaneous human and animal diseases. The possibility of any of the demyelination diseases of man being due to some trace element deficiency has not been seriously considered.

A number of papers have appeared recently dealing with this demyelination encephalopathy in lambs, with allied disorders in man and animals and with experimental demyelination; this review article might be of value in summarising the advances which have been made and wherein we may expect further progress. It is convenient to give firstly the main conclusions resulting from the investigations in England.

SWAYBACK IN ENGLAND

It is now well known that swayback is a nervous disease of newborn and young lambs which occurs, often in enzootic form, in different parts of Britain. The nervous involvement causes a form of paralysis which is often progressive and fatal and which has as its pathology varying degrees of cerebral demyelination and degeneration of the motor tracts. It was shown very early on that there was little likelihood of bacteria or viruses being responsible for swayback—observations which were in keeping with the previous negative results obtained in the case of demyelination disorders in man and monkey. From 1923 onwards in Cambridge many unsuccessful attempts were made to transmit swayback (see also the negative findings of Lyle Stewart (1932) and of Bennetts in Australia (1932)). These facts are emphasised here in virtue of the claim of Mitchell (1937) that "renguera" (now known to be identical with swayback, see below) in Peru was due to a virus. No serious attention can be given to this claim as there was some ambiguity in his paper concerning louping-ill and swayback; these were obviously thought to be identical diseases, the names being used as synonyms, and no pathological data were given identifying which of these two (if one) had been transmitted. It is rather reprehensible that such claims should be made with inadequate pathological evidence as this reference has now crept into the literature as proof that swayback is a virus disease (see Gildemeister, Haagen and Waldmann, 1939). In view of what is now known about the aetiology of swayback and the failure of so many workers to transmit this disease, as opposed to the ease with which Mitchell transmitted "renguera," it is possible that he was working with a spontaneous virus encephalitis and not "renguera" at all.

Before "copper deficiency" was considered as a possible cause of swayback it was contended that the causal agent had a specific affinity for cerebral myelin, or for the mechanism or cells responsible for the laying down of myelin, but only in the case of the lamb *in utero*. The same agent had no apparent ill-effect on the nervous system of the ewe-mother. No evidence was obtained that adult sheep were ever affected or that a similar disorder occurred in other domesticated animals in the same "affected" districts in England. Mild cases often occurred in young lambs; such cases without therapeutic interference were often not progressive and could be bred from in later life.

Although the pathology seemed capable of study and classification, there are still many points which are disputable or even incapable of present explanation. Many of these are related to our ignorance of the detailed anatomy of the ovine nervous system and of myelination. For example, we do not fully understand the relationship between the cerebral lesions, the degeneration of the motor tracts in the cord and the neuronal lesions in the red nucleus. There has also been some dispute about the nature of the tracts in the cord involved; it cannot be too strongly emphasised that no direct comparison can be made of the location of tracts in the cord of sheep with those in man. In fact the red nucleus was examined merely because of the consideration that the direct motor paths in the sheep might be sub-cortical in origin. We were quite satisfied that the disease was a degeneration and not in any sense an aplasia. From the pathological evidence it was thought that the lesion originated at a late stage of gestation and that the causal agent *only* operated while the lamb was *in utero*. These opinions were based on the facts that there was no gross malformation of the brain even in acute cases and that healthy lambs fostered on to ewes which had given birth to swayback lambs never developed the disease. Bearing in mind the differences which might exist between the immature lamb brain and the adult human brain there was no fundamental difference between the pathology of swayback and that of Schilder's disease in man—if the latter is considered only as an anatomical entity. In this connection it is quite pertinent to point out that according to Harris (1937) the brain weight of the new-born lamb is about 80 grammes (human babe about 380 grammes*) and that of the adult sheep is about 95 grammes (adult human about 1,400 grammes*), so that relatively little postnatal growth occurs. Together with studies of the skeletal development of the foetal lamb, Harris reckons that the age of the lamb at birth is equivalent to seven or eight years in the human scale (brain weight 7 to 8 years about 1,300 grammes). As he states, "the number of problems suggested by the differences in development of the new-born lamb and the human babe is infinite. . . . As early as the 36th day the sheep embryo will display mass movement on touching the nose with a glass rod. . . . This early embryonic movement focuses attention on the precocious development of the nervous system of the lamb and throws considerable doubt on the view that myelination of the tracts determines the onset of function therein." Embryology and morphology, therefore, must be expected to contribute a share in further advances in swayback and congenital demyelinating encephalopathies.

The possibility that swayback was a peculiar form of plumbism was considered before any work was done in Derbyshire, but in this county it was more or less thrust upon us. In certain parts of this county sheep must have been slowly absorbing large quantities of lead; so little, however, was known about chronic lead poisoning in animals that it was impossible to decide without more positive evidence that lead was involved at all. It seemed that our most urgent requirement was the possession of a set of criteria

* See Wertham and Wertham, 1934.

which would permit the recognition of early injury to the animal body by lead. It was, however, extraordinary that quite independently the possibility of lead poisoning being involved was considered both with regard to enzootic ataxia (in Australia) and "renguera" (in Peru).

As far as the relationship of copper with swayback aetiology was concerned, the following was as far as could be determined when the last publication was made (some new facts have been described by Bennetts which might necessitate a modification of these views). The possibility that the disease was due to a straightforward copper deficiency was discarded by us as improbable because (*a*) the chemical analyses of the pasture and soils from "affected" areas showed no difference in Cu content compared with suitable controls, and (*b*) while the blood-copper values of ewes which gave birth to swayback lambs were on the whole lower than control animals, many ewes which gave birth to normal lambs were found to show low blood-Cu values during pregnancy. Other important points were that, (*a*) in swayback areas no other manifestations of copper deficiency have been noted in the same or other domestic animals such as have been described in Australia (see below) or such as "lecksucht" in Holland (Sjollema (1933) and (1938)) and (*b*) no disease like swayback has been recorded in "lecksucht" areas. Any experimental approach, therefore, by placing ewes on a copper deficient diet was deemed unlikely to yield results as it would have been difficult to do this artificially and at the same time to have kept the experimental sheep under conditions and environment approaching natural ones. It was postulated that the copper might be present in the grass in such a form that the ewes could not absorb it, or that there was some other unknown factor present in the pasture which inhibited copper absorption, or that there was some alimentary dysfunction which inhibited, or limited, the absorption of copper. Whatever happened it was evident that it took some lengthy period for the "deficiency" to manifest itself in the ewe; this was apparent from the high incidence of disease in lambs from older ewes. As the amount of available copper in the pasture was normal the deficiency could then only be one of lowered utilisation, and this was not necessarily followed by the lowering of the blood-copper values. What happens subsequently is unknown apart from the fact that the deficiency manifests itself only on the myelin of the foetal, or young, lamb. This might indicate that the latter was more sensitive than that of the adult, even though there was such precocity of nervous development in the lamb, or that there was some intrinsic cerebral factor bound up with copper which influenced myelination. This precocity of nervous development might be an important connecting link in the pathogenesis of the disease, and it might be suggested that in experimental work it would be wise either to use sheep, or alternatively an animal in which the young show a similar maturity at birth, *e.g.*, guinea-pig. We were unable to confirm at all (see also McDonald) the suggestion of Bennetts that swayback was connected in any way with a specific anaemia of the ewe or of the lamb, and there was certainly no evidence of the existence of an anaemia comparable to pernicious anaemia in man.

Little more might be expected to come from studies of the spontaneous disease until an approach is made from other angles, and the most likely appears to be the chemical one.

We clearly require more knowledge of the mechanism of myelination and of the part played by copper in enzymatic processes which almost certainly are part of this. One suggestion which might be made now as a possible line of attack concerns the use of radio-active substances. A tracer technique with artificial radio-active elements has been developed in recent years and has already been used with some success in biological work. For example, Hahn *et al.* (1939, 1942) and Schultze and Simmons (1942) have used radio-active iron and copper in studies of experimental anaemia in rats and dogs; Greenberg *et al.* (1943) have used radio-active elements in studies of mineral metabolism and Neilson (1942) has used a similar technique in investigating the permeability of the rat placenta to a phospholipid. Apparently several radio-active isotopes of copper have been described, one of which has been found to be capable of use in physiological experiments. If experiments were carried out along similar lines to the above with radio-active copper it might enable us to determine when copper passed through the placenta and entered the tissue (myelin) upon which, in the case of swayback, the element so rapidly manifests an effect when absent.

Allied Demyelinating Disorders in Man

It might be emphasised as King (1939) stressed, that demyelination is an anatomical lesion common to many apparently unrelated diseases, some of which appear idiopathic while others do not. A distinction must be made between the process of total destruction of nervous tissue in which the myelin disappears as part of a general tissue disintegration (seen so often in the neurotropic virus infections) and the more selective lysis of myelin with the axis cylinders remaining essentially intact for a longer time. The reaction of the brain (see, for example, its reaction to the various neurotropic viruses) to pathogenic agents is a limited one; it is probable, therefore, that the demyelination problem involves many factors. In connection with disseminated sclerosis this has been well brought out in a review by Rhodes (1939) about which theories of causation have been legion. He states that although one cannot assert the causes of disseminated sclerosis, or the other demyelinating diseases, there have been some advances. He suggests tentatively that various factors, some being as yet unidentified, some viruses, some chemical substances and some being bacteria, have the property of causing demyelination. (Many workers might not agree with this statement about viruses and bacteria.) Rhodes discusses the investigations of Putnam *et al.* (1930 onwards) who have brought forward observations, both from the experimental side and from studies of natural cases of disseminated sclerosis, to support their view that the aetiology was connected with an abnormality in the blood which produces intravascular clotting in the nervous system with resultant demyelination. Both endogenous and exogenous factors have been claimed to be concerned in the production of thromboses and consequent vascular obstruction. Rhodes points out that many neuropathologists doubt whether the lesions of vascular origin produced experimentally are of the same character as those found in the natural disease. This aspect has been critically investigated by Dow and Berglund (1942), who state that there is a frequent association of the demyelination lesions to pathological vessels in the brain, but that they cannot assign a causative role to the vascular changes.

Weston Hurst (1941) has recently described cases of a demyelination encephalopathy, hitherto undefined, which he has classified as acute haemorrhagic leucoencephalitis. This disease was characterised by severe damage to the walls of blood vessels, perivascular necroses, perivascular and focal demyelination, intense polymorphonuclear exudation and microglial reaction. The interest of these cases lies in the suggestion of Hurst that the demyelination represented the response of the tissue to a less serious insult by an agent which caused the vascular injury; further, as haemorrhage is a common sequel to vascular injury, it perhaps might be inferred that some forms of haemorrhagic encephalitis and some types of demyelinating diseases may result from the same agent acting with different intensity over a shorter or longer period. In support of this inference he quotes the peculiar cases of encephalopathy described by Russell (1937) occurring after arsphenamine medication which is well known as a cause of brain purpura.

Probably the most interesting observation of natural demyelinating encephalopathy in the human being is the recent case described by Winkelman and Moore (1942); other cases of Mackay (1940) might be placed in the same category. The former refer to their case as a progressive degenerative encephalopathy occurring in infancy with an ante-natal onset and other features similar to swayback in lambs. They compared the clinical and pathological findings with those of swayback in England and suggested that in the main the diseases were closely related. The case of Winkelman occurred in a child (born from normal parents) which died at 12 weeks and which showed from birth spasticity of the limbs and an increasing difficulty in swallowing; the cause of death was broncho-pneumonia, terminal meningitis and marasmus. Pathologically there was diffuse symmetrical sub-cortical demyelination with intense cortical and sub-cortical gliosis, and as in swayback there was some degree of hydrocephalus and hemispheric cavitation. It was suggested that many other cases have occurred and have been described but lie buried in the literature under titles that give no indication of the nature of the process; one reference, Brocher (1932), is given as an example. This deals with a case in an 11-months-old boy who from birth had shown various abnormalities including limb contractures and difficulty in opening the eyes, etc. Autopsy examination revealed diffuse bilateral softening and cavitation of the cerebral hemispheres extending from the frontal to occipital holes. The pictures of the macroscopic appearances of the brain might be replicas of those seen in acute cases of swayback. The author describes possible pathogenesis without coming to any exact conclusion. The case is classified as polyporencephaly.

Allied Demyelinating Disorders in Animals

In the animal field several papers have appeared concerning demyelination and encephalitis in dogs (see also Innes. 1940) which will be dealt with in a separate publication, while Findlay (1940) briefly summarised the demyelinating conditions of animals in general.

A peculiar encephalopathy of the moose has been recorded by King (1939a); apparently with the onset of the disease the moose lose their customary fear of man and develop a staggering gait and paralysis, impaired vision and a secondary anaemia with basophil stippling of the red cells (compare this with the findings of Bennetts in enzootic ataxia in Australia). The lesions included

perivascular areas of demyelination, gliosis and moderate inflammatory reaction; no pathogenic agent was incriminated. The disease appeared to suggest a possible relationship with disseminated sclerosis and other demyelinating diseases in man and animals.

Hurst (1942) has drawn attention to the acute epizoötic leucoencephalitis of horses occurring in Maryland, U.S.A., described by Graham (1936) and Schwarte (1938). This disease has caused heavy losses in some parts of the States; Graham's paper deals with 5,000 deaths in horses in Illinois during 1934-35. The popular name "corn stalk" disease suggests that the aetiology is bound up with a toxic agent in fodder; all efforts to demonstrate a virus have been fruitless. Demyelination was an outstanding lesion and Hurst compared the pathology with the necrotic lesions caused by cyanide poisoning in monkeys.

Olafson (1942) has recorded a peculiar ataxia affecting foals and yearlings in the U.S.A. The pathology was not investigated as elaborately as one might have liked, but there seems to have been ground for comparing this disease with swayback. This is an important record if it is confirmed as, so far, authenticated reports (apart from the case of Winkelman in a child) show that swayback encephalopathy is restricted to lambs. (Other references in this direction are given below in connection with the disease in Australia.)

Enzootic Ataxia or Swayback in Australia

Two main publications have been made from Australia which, for convenience, might be dealt with separately.

McDonald (1942) has made a valuable contribution dealing for the first time with swayback in South Australia, where its occurrence was recorded by Bull *et al.* (1938) in association with "coast disease" on the blown shell sand soils. Subsequent observations have shown that the disease is widespread throughout the southern part of the State. Important facts are brought out by McDonald's observations on unsound fleeces, described in the wool trade as "straight steely," which was a manifestation of the ill-effect of copper deficiency in the ewe and which occurred along with swayback in affected districts. This must be linked up with the similar observation of Bennetts and Beck (1942) in W. Australia, as these are the first indications that the "copper deficiency" producing swayback may exert a pathogenic effect on adult sheep. Similar observations have not been made in England, although I doubt if this has ever been seriously considered by any one with experience of wool grading. McDonald reaffirms many of the main clinical and pathological features which were found in connection both with swayback and enzootic ataxia in Australia. He has described a very interesting case of swayback with typical pathology in a sheep which developed the disease between four and five years; this was considered to prove that if a copper deficiency is sufficiently severe and sufficiently prolonged it can damage the nervous system of the adult sheep. He observed the lesions in the cells of the red nucleus described by us. Their significance is not clear but McDonald suggests that they might be related to the "primary irritation of Nissl. It is doubtful if this type of change has any specificity, as it has been described in a number of unrelated conditions and in different regions of the nervous system. (See also Wertham and Wertham (1934)). It was originally produced by Nissl by tearing the facial nerve and subsequent investigations have shown that it occurs after interruptions of the axis cylinders —hence the term axonal reaction. This was the conclusion about the changes in the red nucleus reached by ourselves. McDonald's haematological findings were similar to those found in England and indicated that although an anaemia might be present it was not an essential part of the syndrome. He states that the administration of copper-containing licks has become a common practice in Australia and that the field evidence available is ample proof of the efficacy of this procedure in preventing the ataxia in lambs.

Bennetts and Beck (1942) have given a complete account of their valuable investigations on enzootic ataxia and copper deficiency in sheep in Western Australia. Much of the ground was covered in previous publications of Bennetts but many additional observations have been made. The disease in Western Australia was found to be much more widespread than was first thought; its distribution was found to coincide with a low copper status of affected areas which caused stock, cereal, and pasture problems known to be due to copper deficiencies. The development and economic use of large tracts of country was definitely impeded on account of a deficiency of copper associated in coastal country with a cobalt deficiency. Linked up with the observations of Olafson (1942), mentioned above, it is interesting to note that Bennetts raises the question of the identity of a "posterior paralysis" of young pigs with swayback and mentions that a lick containing limonite and copper is prophylactic against this pig disease. He also indicates that young foals and calves brought up in areas where lamb ataxia is enzootic develop pathological conditions although there were no signs of involvement of the central nervous system. These animals also appeared to be benefited by copper supplements.

Further evidence is given to show that the demyelination encephalopathy in lambs is definitely associated with a haematological complex both in the ewe and the lamb and that the anaemia and ataxia is correlated with a low copper status of the mothers (liver, blood and milk) and of the affected progeny (liver and blood). Under practical farming conditions copper supplements in the form of licks (top dressings are recommended as better than licks) prevent the occurrence of ataxia, promote optimal growth of lambs and have a marked beneficial effect on the adult members of the flock; anaemia and many other signs of ill health are prevented in breeding ewes and wool growth is normal throughout.

The results of their chemical analyses of the pasture are very different from those obtained in England; excellent reasons are given for this. (See also Beck, 1941). They showed that samples of pasture from areas where copper deficiency symptoms occur contained only three parts per million, while samples from sound areas contain five to 14 parts per million. It seems that different species of pasture plants have different copper-collecting powers and that the analysis of a suitable single species gives more reliable information concerning the true copper status of a particular area. (Our analyses in England were made from random samples.) They also show that there is a variable value in the copper content of pasture as it approaches maturity and that heavy grazing of dried pasture causes a large fall; thus there appear to be several factors which operate in certain seasons and influence the availability of copper to the animal. It would seem from these results that the chemical work in England must be repeated, adopting the methods which have been used in Australia, as our results may not have been an index of the true state of affairs. This might be more important than it would seem, as the Australian work suggests that pasture analyses alone give an indication of areas on which copper deficient symptoms in stock might be expected. Bennetts and Beck also discuss the occurrence of "stringy wool" in sheep pastured on copper deficient country (see also the reference by McDonald about "steely wool"). They describe the wool as having a limp, glassy and straight appearance.

"Renguera" (Swayback) in Peru

In the paper by Innes and Shearer reference was made to a disease of lambs investigated by Gaiger (1917) which had been previously studied by Tabusso. Gaiger stated that it "bore some resemblance to swayback, but because little was known at that time about nervous disorders in sheep (*viz.*, louping-ill, scrapie and swayback) it was uncertain how far the similarity existed." The pathology of "renguera" was not investigated and the aetiology was not determined, although Gaiger at that time was inclined to identify the disease as being of bacterial origin. A more recent publication has appeared by Tabusso (1942); the identification of "renguera" with swayback can no longer be in dispute. He states that it is a form of paralysis occurring in lambs from birth up to the first or second month of age. The disease occurred in districts in Peru which are geographically continuous and which have a uniformity of climates and soil conditions (incidentally, these areas involve one of the great copper mining districts in South America!) The first record of this disease occurred in the Department of Junin, 1911, and in less than two years had spread over the high plateau covering the whole width of the Cordillera. Tabusso mentions that the disease also occurs in the llama, alpaca and vicuna—all animals which are herbivorous, chew the cud, carry wool and the young walk at birth. The early records indicated that the disease was uniformly fatal, most lambs dying in about 15 to 20 days, others up to two or three months. He gives details of the mortality in certain farms in Junin where it must have caused enormous losses; for example, 4,000 lambs out of 7,000 births were lost in one small area. From 1916 onwards it appeared to decrease in incidence, but the same history of an irregular incidence in different areas from year to year was noted as in England and Australia. In later years bad outbreaks occurred particularly in 1934-37 with another decline which probably reached a minimum in 1940-41. He gives details of the incidence of the disease in other departments of Peru where it has had a similar history. Tabusso discusses at length the various suggested origins of "renguera" which have arisen from time to time. The idea that the disease was infectious was an old one although it was never properly substantiated; he states that "tests to show the evidence of a pathogenic bacterium and also efforts to produce the disease failed completely year after year." Before the proper nature of the disease was discovered by Tabusso he apparently had been influenced by Mitchell's results and was inclined to believe that a virus was responsible. As in England and Australia considerable attention was devoted to the possibility that the disease was due to lead poisoning arising from contamination of the pasture by the large number of blast furnaces in "affected" areas. He gives a considerable amount of evidence

to show that there was no clear relationship between lead (or arsenic) poisoning and the disease; for example, the years 1916-22, when the disease was declining in incidence, coincided with a period in which the blast furnaces were working at full production. The latter part of this paper deals with a confirmation of many of the findings which were obtained in connection with the disease in Australia and England; recent investigations have included the examinations of brains of acute cases. The photographs and descriptions of the lesions permit of no doubt that the disease is identical with swayback in England. Good results have already been achieved by administering copper supplements to the ewes.

Experimental Demyelination Diseases

Experimentally, a number of unrelated substances have been described which cause demyelination; the main references are given in papers by Innes and Shearer, Rhodes and Weston Hurst. These substances have included tetanus toxin cobra venom, saponine, carbon monoxide and cyanides; apart from the cyanides, they do not require much reference as they have been commented upon previously. Weston Hurst (1940) has published further experimental work dealing with cyanide demyelination and a number of interesting results have emanated from this work. He states that, as is well known, cyanide has a powerful inhibiting effect on the oxidative ferment of cells, causing death by histo-toxic anoxia; the distribution of the demyelinating or necrotic lesions in the cerebral white matter after poisoning with KCN was very similar to that in Schilder's disease. This correspondence was sufficiently exact to suggest some underlying factor common to the two conditions. In histological detail the more acute lesions also bore some resemblance to acute equine epizootic leucoencephalitis (" corn-stalk " disease) in which a toxic factor present in damaged fodder has been suggested to be the causative agent. Hurst (1942) believed that the whole trend of his observations seemed to show a continuous series of lesions with cortical necrosis at the one extreme and demyelination at the other. The most severe anoxaemia led to damage of the cerebral or cerebellar cortex and less severe anoxaemia to necrosis of the basal nuclei. Necrosis in the basal nuclei or white matter and demyelination in the white matter resulted from repeated smaller insults each insufficient to damage the cortex seriously. He stated that if we regard the white matter as possessing a poor capacity to recuperate from a number of relatively minor insults, which do not damage the grey matter, they may result in either necrosis or demyelination according to their intensity. Further advances might be expected to come from experimental work along these lines.

Probably the most interesting other experimental observations on the demyelination problem are those of Rivers *et al.* (1933, 1935) who claim to have produced demyelination in monkeys by repeated intramuscular injections of heterologous (rabbit) brain emulsions. The monkeys developed ataxia, facial paralysis and blindness and a diffuse demyelinating encephalomyelitis was observed at autopsy. Although, as Rivers freely acknowledged at the time, the methods might seem to have been far removed from anything which could occur under natural conditions, nevertheless they indicated a method of study of the demyelination process. They also led him to make the suggestion that this group of diseases might be due to the development of anti-bodies against brain tissue anti-brain anti-bodies; this hypothesis might have been more exciting if either brain antigen or anti-brain anti-bodies had been demonstrated in the blood of patients suffering from demyelination diseases. This method of producing demyelination was in keeping with other observations that brain or cord tissue may be responsible for demyelination found in the encephalomyelitis which occasionally complicates anti-rabies vaccination. (The technique employed is parallel with that which has been used so successfully for the production of an acute glomerulo-nephritis originally investigated by Masugi (1933) and later by many others.) Kolb and Bolton (1940), however, have repeated the Rivers' experiments and were unable to produce any lesions using rats and rabbits instead of monkeys; they throw doubt on the ideas put out by Rivers. Their negative findings are supported by those of Weston Hurst and my own (none of these workers have used monkeys). In my own experiments sheep and lambs failed completely to show any ill-effect after prolonged intramuscular injections of rabbits' brain emulsions over a period of a year. On the other hand Ferraro and Jervis (1940) produced similar lesions in monkeys to those noted by Rivers, although clinical signs did not appear until about a hundred days had elapsed. Kolb and Bolton drew attention to the fact that the lesions produced by Rivers (and those might include those produced by Ferraro and Jervis as well), although contended to be similar to those in Schilder's disease, did in fact contain eosinophils and unusual forms of giant cells. These facts along with others might raise the question whether the lesions were those of true demyelination as they were not confined to the white matter and occurred in both the cerebral and cerebellar cortex. Many of the lesions might have been in the nature of small granulomatous areas demyelinated to some extent but with myelin sheaths running through the masses of histiocytic giant cells. Their nature is uncertain, but they might have been caused by the introduction of some organism of attenuated virulence, or the deposition in certain of the small vessels of particles of lipoid to which these granulomata were reactionary. From the nature of the experiment one might possibly consider the latter. (This is supported to some extent by the findings in a peculiar case of lipoid dystrophy (Van Bogaert, Scherer, Epstein) in which there was a degeneration of nervous tissue with giant cell formation occurring where the abnormal lipoid was deposited in the nervous system—brought to my notice by Dr. J. S. Greenfield.) The conflicting results which have been achieved along this line by various workers (but using different experimental animals) and the fact that a different interpretation might be placed on the nature of the lesions produced, indicate that further experimental work is required.

Conclusions

Demyelinating disorders now constitute a large group of diseases affecting both man and animals. The common lesion—demyelination—is an anatomical entity and in the absence of exact knowledge concerning the aetiology, classification is extremely difficult. There must not be too great a nosological urge as many of the clinical and pathological differences might, for example, be due to differences in the virulence, initial intensity of onset of the " causal agency " and to the stage of development when the nervous system is attacked. The evidence of the last few years gives further indication that neither viruses nor bacteria are directly incriminated in demyelination disorders, although there is a group in both man and animals which seemingly are " post-infective," occurring after certain specified virus infections. The investigations on swayback have shown that it is a prototype of a certain group of demyelination disorders in the human being hitherto grouped under the general term " diffuse sclerosis." As swayback has been shown to be bound up with copper deficiency and to occur in many different parts of the world, it seems that the time has come when the possibility of certain human demyelinating disorders being due to some trace element deficiency should be seriously considered. The fact that swayback is caused by a " copper deficiency " in the soil or pasture indicates that its occurrence might be more widespread than at present believed, and it must not be overlooked that the same " causal agency " responsible for swayback might cause a totally different disease manifestation in adult animals or even in other species. It is quite clear that an experimental approach is the most urgent need at the moment for further advances to be made.

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CLINICAL COMMUNICATION

Needle removed from Stomach of Dog by Feeding on Cotton-wool Diet

A. LAWTON TURNER, M.R.C.V.S.

(Junior Assistant to H. W. Dawes, M.R.C.V.S.), West Bromwich

Subject.—Bull-dog puppy, aged three and a half months.

History.—*August 4th.*—The puppy picked up the needle, which was threaded with wool. The owner, seeing the wool hanging from the puppy's mouth, pulled on it thinking she might remove the needle, but unfortunately the wool came away and left the needle *in situ*. Violent emesis was set up and the owner, becoming concerned, rushed the puppy to the surgery.

Oral examination did not reveal any sign of the needle and gentle palpation externally did not cause discomfort to the puppy, which had by this time ceased to vomit and assumed quite a normal attitude.

The owner was advised on returning home to feed the puppy with about a handful of boiled rice, and keep it very quiet pending X-ray examination.

August 5th.—The puppy appeared to be quite well the following morning and had not vomited the meal given to it the night before.

The X-ray plate showed the needle to be in the stomach.

Treatment and Course.—It was decided not to perform gastrotomy but to feed the puppy on a cotton-wool diet, similar to that fed to children who have swallowed foreign bodies of the same nature. (See *B.M.J.*, page 352, March 20th, 1943.)

The owner was instructed to tease out some cotton-wool and mix it thoroughly with mashed potato, stale bread crumbs and finely minced cooked horse-flesh, and feed the puppy four times during the day, each meal to weigh approximately 1½ ounces.

The feeding was carried out at the owner's home and strict instructions were given regarding keeping the puppy quiet and examination of each motion passed. The puppy, of course, was not allowed out of doors.

August 6th.—The puppy appeared to be quite normal. The owner stated that she had no difficulty in getting the puppy to eat the strange diet.

August 7th.—The needle was passed inside the cotton-wool with the point protruding, the time taken in the whole process of passing it being approximately 70 hours. The length of the needle is 6·25 cms. The weight of the cotton-wool passed was one ounce, which represented the amount contained in eight meals.

ABSTRACTS

[A NEW SYNTHETIC ANALGESIC: A REVIEW OF ITS PRESENT STATUS AND COMPARISON WITH MORPHINE. Batterman, R. C., and Himmelsbach, C. K. (1943.) *J. Amer. med. Ass.* **122**. 222.]

Demerol (1-methyl 4 phenyl-piperidine 4-carboxylic acid ethy ester hydrochloride) exerts three actions. These are :—

1. *Analgesic.*—Given parentally it is as effective as morphine in producing clinical analgesia, 100 mg. demerol being equivalent in this respect to 10 mg. morphine. Oral administration is less satisfactory.

2. *Spasmolytic.*—This is due to an atropine-like action upon the parasympathetic nerve endings. The action is described as follows : "In direct contrast to the action of opiates, the motility of the intestine is so influenced that the segmental contractions and tone are diminished or abolished, while propulsive action is unaltered. Clinically this action is manifested by rapid and often dramatic relief of colicy pain. Prolonged use of this drug in therapeutic doses does not result in constipation." From this account it appears that demerol might be of use in the treatment of colic in horses.

3. *Sedative.*—This effect can be produced by large parenteral doses.

The drug is given for the relief of pain at intervals of three to four hours ; it is rapidly destroyed in the liver but prolonged and heavy dosage may lead to muscular tremors and even epileptiform seizures.

A. T. P.

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[A PREPARATION FROM SPOILED SWEET CLOVER (3, 3'-METHYLENE-BIS-(4-HYDROXYCOUMARIN)) WHICH PROLONGS COAGULATION AND PROTHROMBIN TIME OF THE BLOOD: A CLINICAL STUDY. Allen, V. A., Nelson, N. W., and Waugh, M. D. (1942.) *J. Amer. med. Soc.* **120**. 1009.]

Dicoumarin, the active principle present in improperly cured clover hay or silage, causes a haemorrhagic condition in cattle. The recent isolation and synthesis of this substance has led to its employment in human medicine as an anticoagulant in which capacity it proves satisfactory as a prophylactic against thrombosis or as a preventive against the extension of intravascular clotting. The principal effect of oral administration is reduction of the prothrombin content of the blood. The initial dose is 0·3 gramme followed by doses of 0·2 gramme at intervals of 24 hours. The prothrombin time of the blood is increased after a latent period of 24 to 48 hours but after cessation of dosage this effect persists for two to three weeks. The use of this drug must be accompanied by frequent determinations of the prothrombin time, for should this become too great haemorrhage is likely to occur.

A. T. P.

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[EXPERIMENTAL ALTERATION OF THYROID FUNCTION IN CATTLE. Bullard, J. F., and Andrews, B. S. (1943.) *J. Amer. vet. med. Ass.* **102**. 376.]

On the assumption that the differences between beef and dairy cattle are due largely to the size and activity of the thyroid glands (the thyroids of dairy cattle are larger than those of beef animals), these experiments were performed to study the possibility of regulating the growth of cattle by interference with these glands. Total thyroidectomy was performed upon twelve animals from 3 to 18 months old but in two only did symptoms of thyroid deficiency occur. In general the only effect noticed during the first post-operative six weeks was a slight increase in the daily increase in weight, due, presumably, to increased fat deposition. The animals were slaughtered 26 weeks after operation and in all, except the two showing symptoms, considerable quantities of thyroid tissue were recovered. It is believed that both glands, including the isthmus, were removed at operation and histological study of the recovered tissue revealed marked hyperplasia and hypertrophy. The authors attribute the non-appearance of symptoms to rapid regeneration of the gland.

A. T. P.

DECLINE IN SHEEP STOCKS

The National Farmers' Union Livestock Committee learned recently from Mr. G. Gibbard that the reduction in the sheep population has reached such a low ebb that the Ministry of Agriculture were prepared to do what they could to encourage the keeping of all classes of sheep. With Mr. J. A. Lloyd and Mr. S. O. Ratcliff he had discussed the sheep situation with officials of the Ministry and while no definite decision was reached he certainly felt that the Ministry were concerned with the decline in sheep breeding and were trying to find a way to increase the number of both pedigree and commercial stocks,

Veterinary Surgeons and Military Service

Joint Announcement by Ministry of Agriculture and Fisheries and the Ministry of Labour and National Service

1. In order to advise them on the measures which should be taken should the number of veterinary surgeons volunteering for commissioned service in the Royal Army Veterinary Corps fall short of military requirements, the Ministers concerned set up in May, 1943, the Army Service Veterinary Selection Committee of which Mr. John Smith, O.B.E., M.R.C.V.S., D.V.H., is Chairman and which comprises two representatives each nominated by the R.A.V.C., the Royal College of Veterinary Surgeons and the Ministry of Agriculture and Fisheries. The recommendations of this Committee which are briefly set below, have been accepted and will be introduced immediately.

2. A "pool" of veterinary surgeons has been formed from which the men needed for service in the R.A.V.C. will be recruited as required. This "pool" will comprise the following groups:—

(*a*) Men who graduated since January 1st, 1940.

(*b*) All future graduates.

3. In view of the great importance of maintaining essential veterinary services vital to the nation's war effort, the men in this "pool" who will be made available for military service in this way will be selected veterinary surgeons whose withdrawal from civil employment will be likely to cause the least possible disturbance to essential veterinary services.

4. The procedure for selection will be as follows:—

(*a*) The men concerned will be asked to complete a form of questionnaire which must be returned to the Committee without delay.

(*b*) The cases of men who, from the particulars given in the questionnaire, appear to be suitable for service in the Corps, will be investigated on behalf of the Committee by responsible officers of the Veterinary Inspectorate of the Ministry of Agriculture and Fisheries who will interview the employer and the man concerned. The object of this investigation is to furnish the Committee with an appreciation of the local situation to enable them to determine whether the man concerned could be released, if required, for service in the Corps without serious detriment to essential veterinary services.

(*c*) Each case will thus be considered on its merits by the Committee who will prepare a list of men whom it considers could best be spared.

(*d*) The men on this list will then be summoned for interview by the Director of the Army Veterinary and Remount Service and those found to be suitable and medically fit for service will be offered commissions in the Corps.

(*e*) Men who, without good cause, refuse to accept the offer of commissions will be regarded as available for calling up for General Service in the ordinary way.

(*f*) Men to whom the R.A.V.C. do not propose to offer commissions will be allowed to remain in their civil employment.

5. The recruitment of volunteers will be continued as at present and veterinary surgeons (including men in the "pool") who wish to volunteer for service in the Corps should communicate with the Director of Army Veterinary and Remount Services, The War Office, Droitwich Spa, Worcestershire.

6. Any enquiries regarding the above arrangements should be addressed to the Secretary of the Army Service Veterinary Selection Committee, Ministry of Agriculture and Fisheries, Block 4, Bickenhall Mansions, London, W.1.

October 5th, 1943.

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Weekly Wisdom

The man of science has learned to believe in justification, not by faith, but by verification.—T. Huxley.

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Because the U.S.A. Selective Service System will not defer veterinarians who are not essential in their communities and very few of those who are inducted in the Army can expect to receive a commission, the Directing Board of the War Man-power Commission's Procurement and Assignment Service is urging non-essential doctors of veterinary medicine to relocate in communities where their services are urgently needed.—*Vet. Med.*

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Oct. 12th.—Special Meeting of the Royal Counties Division, N.V.M.A., at Reading, 2.15 p.m.

Oct. 12th.—Special meeting of the Scottish Metropolitan Division, N.V.M.A., at the Royal (Dick) Veterinary College, 2.15 p.m.

Oct. 14th.—Meeting of the Scottish Branch, N.V.M.A., at Glasgow, 10.45 a.m.

Oct. 14th.—Meeting of the Derbyshire Division, N.V.M.A., at Sutton Bonington, 2 p.m.

Oct. 15th.—Meeting of the Mid-West Division, N.V.M.A., at Bristol, 2.30 p.m.

Oct. 15th.—Special meeting of the South Wales Division, N.V.M.A., at Llandilo, 2 p.m.

Oct. 15th.—Meeting of the Lancashire Division, N.V.M.A., at Preston, 2.30 p.m.

Oct. 22nd.—Meeting of the Lincolnshire and District Division, N.V.M.A., at Lincoln, 2.30 p.m.

Oct. 22nd.—Meeting of the Yorkshire Division, N.V.M.A., at Leeds, 2.30 p.m.

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The Annual Meeting and Conference

Fore-knowledge of momentous issues for discussion assured a record "war-time" attendance for the 61st Annual General Meeting of the National Veterinary Medical Association of Great Britain and Ireland, which was held on Wednesday and Thursday of last week at the London School of Hygiene and Tropical Medicine. As an asset of special significance and value in the continuing circumstances of international conflict, the "National" welcomed again the presence of a strong body of representatives of Allied Forces and Governments and, in particular, the opportunity of reciprocating the felicitous message from the Association's great counterpart in the United States transmitted by Colonel Edward Curley, leading the impressive American contingent.

The accompanying conference owed its undoubted success to a progressive purposefulness in its deliberations, carrying an important step further the fulfilment of the obligation set before the Association by its leaders at the commencement of hostilities, to make the utmost contribution to the maintenance of national nutrition at this time and towards ensuring that, in happier days, our fellow-men may be enabled to "live more abundantly."

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For the second year in succession the programme had a splendid start at the Waldorf Hotel on the occasion of the President's reception, when Dr. and Mrs. Wooldridge received and most hospitably entertained a large company of members and their ladies. The London School of Hygiene and Tropical Medicine was the venue of the subsequent meetings and there, on the morning of the following day, Wednesday, September 29th, the President placed the Association further in his debt with an address which will long be of service to his hearers.

Taking as his stimulating theme "The Veterinary Profession and the Nation," the President refrained from pursuing his last year's concept of an autonomous Animal Health Corporation, though it is interesting to note that at their recent representative gathering our medical colleagues adopted an analogous proposal, also in preference to Government departmental control, for the administration of a national medical service. Instead, Dr. Wooldridge entered upon a penetrating survey of the moulding of the profession in its present form, the existing situation as regards its duties and the framework for their accomplishment, and the work awaiting the veterinarian. This last was obviously governed by two main factors—the future of agriculture and the future of human nutrition. Accepting the assurance of the Minister of Agriculture under the first head as evidence of good intent, then the profession should embark upon determined action to help to convert into reality the intention of maintained prosperity for agriculture.

No long-term policy for agriculture could be successful unless it included a sound livestock industry: the profession held a unique position as the national interpreter of the needs of agriculture in terms of human health, and the needs of human health and nutrition in terms of agriculture.

Throughout its history the profession had adapted itself and its organisation to render maximum service to the community, and without doubt it would again adjust itself to meet the changing demands necessitated by the interests both of the profession and the nation. It should proceed actively to work out its long-term policy, making this a bold one and one designed to benefit the community to the utmost. Government and public alike had a more lively and accurate appreciation than heretofore of the profession, its work and its possibilities, and despite a superficial complacence in some quarters with the *status quo*, there was among our members a widely held conviction that the stage is set for professional advancement in many directions and that the opportunity is there to be seized if only the profession will show determination to co-operate with others to secure it: the best conditions for such co-operation would follow upon proof of worth. Without the goodwill, understanding and assistance of the Government and the public, the profession cannot assume its rightful place in the community. To ensure these the profession must demonstrate its willingness to accept its national responsibilities and to co-operate with others to fulfil them: every responsibility loyally accepted brought its own privilege. It should be the role of the National Veterinary Medical Association to focus the power of the profession. "With a bold spirit of enterprise, supported by a sound education, an adequate personnel, a trust in each other, a wholesome self-confidence and a will to serve, I believe the profession can give great service to the nation and achieve high status for itself."

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As was anticipated, the attendance reached remarkable proportions on Thursday on the resumption of Annual General Meeting at the close of the intervening Conference. Business recommenced with one of the happiest coincidences in the history of the Association—the handing by the President of the certificate of Honorary Membership of the Association to his revered uncle, Professor George H. Wooldridge, to the value of whose services on its behalf the present strength and influence of the N.V.M.A. themselves bear impressive witness. "Teacher of veterinary students for 40 years this month," honoured in the history of the Association as an indomitable stalwart, particularly during the harassing period of the last war, members were moved by his appeal to them "as an elder brother" to preserve unity in our ranks.

Controversial opportunity was further delayed while presentation of the Dalrymple Champneys Cup and Medal was made to Mr. W. A. Pool, for work of outstanding merit in scientific research, the President speaking of the value of his labours for the Imperial Bureau of Animal Health, "an organisation which has done untold good in building up sure foundations for veterinary science." Mr. Pool's earlier investigations in louping-ill constituted an outstanding achievement which had not yet received the recognition it deserved.

The meeting then turned its attention to the issue, placed before it by Dr. Hare, which has been exercising the minds of members throughout the country since the recall of the Loveday Committee on Veterinary Education. The evidence submitted to that Committee by the Association—a possible interpretation of one of its paragraphs, with special reference to repercussions on the one-portal system of entry to the profession; the degree to which that evidence represented the opinion of the general body of members; the manner in which the situation had been handled, albeit constitutionally, under pressure of an apparent urgency, were points among many thrashed out thoroughly. The debate was worthy of its vital theme, and, for the most part, commendably to the point of the following motion on the agenda which, safely surviving all suggested amendments, was carried by 120 votes to 33: "That this Annual General Meeting is deeply apprehensive that any departure from the hitherto declared policy of the Association of upholding the one-portal system of entry into the profession without a clear mandate from a majority of the Association would imperil the existence of the Association and the integrity of the profession and orders that the relevant motion, passed at the Council meeting on June 16th last, be rescinded, and that intimation of this recission be forwarded to the Secretary of the Loveday Committee."

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The election of officers ensued, with the following results: *President*: Major R. C. G. Hancock, of Beaconsfield; *Vice-Presidents*: The retiring President and Professor Wm. C. Miller (President-Elect); *Hon. Treasurer*: Mr. H. E. Bywater (re-elected); *Hon. Secretary*: Captain W. G. Wragg (re-elected); *General Secretary*: Mr. F. Knight (re-elected); *Solicitors*: Messrs. Fowler, Langley & Wright.

An Association which has boldly turned the adverse circumstance of war to good account, as is shown by a steady increase in membership and in prestige where such is most to be desired, owes much to strong leadership, and at the close of his second consecutive term of office the members left their retiring President in no doubt of their strong sense of indebtedness. Warm acknowledgment was made that the presidential tradition of untiring and selfless devotion to duty has been most worthily upheld by Dr. Wooldridge during his two years' tenure. Mr. Hancock's accession was acclaimed as the advent of a practitioner of known qualities assuredly to come to full flower in the highest office. Following his induction, annual meeting concluded its business by appointing a committee to examine the Articles of Association, with particular regard to those governing the appointment of representatives to serve on the Council.

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The close and friendly liaison between the profession and agriculture which has been so significant a feature of the recent history of the Association was exemplified most happily at the Annual Luncheon on the Wednesday, when the principal guest was Mr. P. A. Kerstens, Minister of Agriculture in the Government of the Netherlands. Both subjects discussed at the Conference were, he said, of the utmost importance to his country under the present tragic circumstances. The panel scheme for dairy cattle was an enterprise followed with great interest in Holland, where services of a similar nature had demonstrated its great value to the farmer. The animal health services would have to play a prominent part in the restoration of their decimated herds. Mr. Kerstens' hearers resident in this country learned with envy that in Holland their colleagues are responsible for the whole meat inspection, the organisation and management of all public slaughterhouses and a most important part in milk inspection. The speedy rise and progress of the Netherlands East Indian community was in no small measure due to the fine efforts of their Colonial Veterinary Service.

The President, replying to Mr. Kerstens' toast to the Association, reminded the company that the profession was the agency potentially able to play the greatest part in procuring a healthy future for mankind, for it had as its province both human well-being and that of agriculture, the most basic of all industries. But the responsibilities in this great matter were not theirs alone: it was up to the Government, the owners of animals, and the medical profession to help, for the veterinary profession could not fulfil its tasks adequately unless they, for their part, gave it the opportunity—and the facilities—to achieve results. Whenever those in authority had accepted the services the profession could render, the profession had not failed them. The President concluded with a reference to the attainment by the Royal College of its centenary, to which Mr. Nairn, the President of that body, made eloquent response by way of appeal for universal observance of our motto "*Vis Unita Fortior*": we must be prepared to keep open minds and to adapt our programme to the necessities of the future.

Miss Joshua's graceful reference to each of the principal guests was acknowledged in valuable speeches by the Duke of Norfolk, Joint Parliamentary Secretary to the Ministry of Agriculture, and Mr. Salt, M.P., Chairman of the Parliamentary and Scientific Committee. His Grace thought it was because of the smallness of the veterinary profession in this country that we still had far too much disease amongst our animals. As Chairman of the Veterinary Education Trust, he believed that if the Trust could produce some form of scholarships, post-graduate courses or refresher courses, it would assist to promote a form of education which

would not only be beneficial to the nation, but would appeal to the right type of man for the job in hand.

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War-time limitations have determined the exclusion of those technical expositions of our art which normally form the backbone of the scientific proceedings, in favour of papers dealing with wider issues. Accepting this necessity, and the desirability of doing timely service to the major pre-occupations of all thoughtful men amongst us, none could cavil at the choice of "The Veterinary Surgeon in the Development of the Colonies," and "The Improvement of Livestock." As a call for the enlistment of young graduates in a noble service the contribution made by Major J. M. Smith, formerly Chief Veterinary Officer to the Department of Agriculture in the Government of Palestine, meets a long-felt need, and we commend to all such, when the proceedings are published, a careful study of his examination of the role to be played in "participating in the fascinating task of developing a colony, which calls for the devoted service of many specialists, amongst whom the veterinarian ranks very high." Tribute is paid to the part played by the N.V.M.A., through representations to the Secretary of State, in raising the status and improving the conditions of service of the Colonial Veterinary Officer, which may be said to have culminated in the creation, in most colonies, of veterinary departments in no way subordinate either to the agricultural or the medical department. A well-justified plea for a fuller recognition of the claims of the colonial field upon the limited man-power of the profession led to the impressive conclusion: "It must be clear to all that if the responsibility for the complete development of the colonial territories is to be adequately discharged and the terms of the Atlantic Charter are to be interpreted to the full, the subject is one of immediate interest not only to veterinary surgeons in the colonial service but also to the profession and the community here at home."

The discussion was Empire-wide in contributors as in scope, but for present purposes reference must be limited to Professor Kearney's able opening, which reflected the whole in its emphasis on the duty resting on our profession in regard to the future welfare of the colonies. There was no doubt that the demand for veterinary surgeons would develop into considerable dimensions at the termination of the war, and preparations to meet it were imperative. Professor Kearney illustrated vividly from his own experience in Kenya and Nigeria, the outstanding role played by veterinary science in increasing the prosperity of the colonial peoples. Like all other applied sciences, ours had become specialised and the future demand for veterinarians in the colonies would necessitate a supply of specialists: this was a matter in which the Association should have a considerable say.

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A body busily pioneering in the field of "animal health mindedness" found of the utmost significance Professor Robert Rae's discourse on so fundamental a factor as the means to be taken for the improvement of livestock, the production of which "must still remain our dominant form of agriculture" and without which the maintenance of much of our land in a state of reasonable fertility cannot be achieved. The description in large measure an accurate one, of this country as the "stud farm of the world" must not blind us to the fact that a top stratum of very fine livestock represented only a small percentage of the total livestock population: "then comes a solid middle of what one generally referred to as good commercial herds, and after that, it has to be admitted, much too big a tail end of inferior, unprofitable, nondescript stock"—the aim should be to raise the level of all as near as possible to that of the best.

While, under war conditions, crop production was still in Government eyes of paramount importance, more emphpasis was gradually being placed on the livestock side of farming: Professor Rae proceeded to summarise and comment upon some of the schemes at present in existence which have as their object some aspect of livestock improvement, though perforce confining his observations largely to dairy cattle. In a notable preface to these, however, he outlined the history of the Dairy Shorthorn herd at the University of Reading's farm, with its successful combat against tuberculosis and contagious abortion, to illustrate the possibility of attaining a home-bred, self-contained herd of pedigree status without the purchase of any pedigree stock except bulls. As for the schemes themselves, Professor Rae attached immense importance to official milk recording, which "must form the basis of any policy for the breeding of better dairy stock." The classification of herds (or dairy herd survey) and the register of bull breeding herds, schemes to be operated by the County War Agricultural Committees, both had great possibilities in the raising of the general livestock level. The former would provide a sound foundation for whatever superstructure it might be decided to build on the information it produced; the latter would promote the much-to-be-desired wide dispersion of good bull calves.

His experience at the Reading centre prompted the essayist to accord artificial insemination favourable mention in relation to his general theme. A strong case for the introduction of boar licensing and of a national pig recording scheme to carry on and co-ordinate the excellent work which was in progress in some counties before the war, was introduced into a "grading-up" picture completed by stressing the necessity for paying greater attention to general stamina and health, particularly of our breeding livestock. The profession must play its part in the application to the farm of nutritional knowledge—Professor Rae did not subscribe to the view that the veterinary practitioner should be only a clinician.

Colonel E. M. Curley, Chief Veterinarian, U.S.A. Army in the European Theatre of Operations, again placed the Association in his debt by contributing a masterly opening to a discussion which, ably continued by Dr. Bakkr and Mr. S. L. Hignett, was most informatively sustained by the general body of members.

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GENERAL OBITUARY

Robson.—At Glenroyd, Laurencekirk, on September 13th, 1943, Emily Arabella Bowstead, dearly beloved wife of Ex-Provost H. W. Robson.

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ROYAL ARMY VETERINARY CORPS

The following announcements are made in the issue of *The London Gazette* dated September 24th, 1943: To be Lts.: David Hill (287243) (July 29th, 1943); Roger Lawson Steele (287352) (August 3rd, 1943); David Alexander Forbes (287242) (August 4th, 1943); Eric Pierson (264185) (August 6th, 1943); George Edward Crabtree (287962) (August 9th. 1943).

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THE PREDOMINANT SOCIAL AIMS OF MODERN EDUCATIONAL REFORM

The recent Conway lecture• given by Sir Richard Gregory, says the *Lancet* (1943, May 29th, p. 682), is timely, refreshing and rationalistic. He summarises the theme which the lecture develops by saying that "efficiency of individual service and right conduct are the primary social aims of educational endeavour, whatever means or methods are used to promote them"; but he particularly traces the influences of the scientific age on conduct. Ethical principles themselves he claims as a part of the science of ethnology. The failures of orthodox religious teaching to advance social standards receive inevitable comment, while "the improvement of means of living, and the broadening of man's intellectual and social horizons" are as inevitably attributed in large part to scientific method and discovery.

The social and disciplinary value of a natural training of the senses by observational studies is emphasised and the proper sequence of appeals in turn to the "wonder motive" (or curiosity), the "utility motive" (or instinct of power) and the "systematising motive" (or exercise of reason), is clearly outlined. We stand, or hope we stand, concludes *The Lancet*, on the eve of great educational reforms. Whether their concern be with general, medical or other special education, the aims of the modern reformer are predominantly social and he should be grateful for the stimulus and wisdom to be found in this small book.

• Education in World Ethics and Science, by Sir Richard Gregory, BT., F.R.S. (Watts, pp. 39, 1s.)

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Speaking at the annual meeting of the British Standards Institution the chairman said that there are in current use about 1,500 British standards, and during the past year 230 new and revised standards or amendments had been issued.

CONTROL OF DISEASES OF DAIRY CATTLE

STATEMENT SHOWING THE NUMBER OF UNDERTAKINGS NOTIFIED TO THE MINISTRY OF AGRICULTURE DURING THE MONTH OF SEPTEMBER, 1943

County	Undertakings Notified	Total Undertakings			
	During Month	Previously	Number	Number of Cattle	
				Cows	Heifers
ENGLAND AND WALES					
Bedford	1	39	40	904	493
Berks	2	88	90	3,219	2,054
Bucks	8	78	86	2,281	1,670
Cambridge	—	17	17	371	163
Chester	10	375	385	12,625	4,355
Cornwall	—	8	8	154	103
Cumberland	1	58	59	1,439	1,262
Derby	11	280	291	8,470	4,702
Devon	9	196	205	3,366	1,969
Dorset	3	69	72	2,237	1,152
Durham	7	248	255	5,751	1,990
Essex	4	238	242	8,604	4,928
Gloucester	1	87	88	2,653	1,446
Hampshire	12	354	366	10,438	6,352
Hereford	—	32	32	471	251
Hertford	2	66	68	2,155	1,244
Hunts	—	14	14	529	366
Isle of Ely	—	2	2	26	54
Isle of Wight	—	18	18	321	155
Kent	5	137	142	3,267	1,838
Lancs	8	207	215	6,026	1,803
Leics	1	84	85	2,245	1,594
Lincs (Holland)	—	3	3	25	11
Lincs (Kesteven)	—	21	21	268	143
Lincs (Lindsey)	5	80	85	1,681	941
Middlesex	—	13	13	529	241
Norfolk	2	175	177	5,405	3,682
Northants	2	73	75	2,031	1,375
Northumberland	1	53	54	1,756	852
Notts	6	123	129	3,033	1,742
Oxford	1	38	39	1,197	1,044
Rutland	—	9	9	157	109
Salop	3	250	253	7,814	3,745
Soke of Peterborough	—	1	1	37	31
Somerset	6	191	197	5,341	2,390
Staffs	1	193	194	5,669	2,983
Suffolk, E.	1	96	97	2,293	1,668
Suffolk, W.	—	47	47	1,012	601
Surrey	—	115	115	3,198	1,415
Sussex, E.	—	180	180	4,755	2,623
Sussex, W.	1	119	120	3,351	1,900
Warwick	—	122	122	3,104	1,824
Westmorland	—	18	18	502	571
Wilts	3	82	85	3,588	1,642
Worcester	2	144	146	3,115	1,501
Yorks, E.R.	3	88	91	1,441	814
Yorks, N.R.	2	110	112	2,226	1,353
Yorks, W.R.	5	249	254	6,502	2,428
Anglesey	—	39	39	689	525
Brecon	1	4	5	120	65
Caernarvon	—	107	107	1,749	908
Cardigan	—	16	16	246	195
Carmarthen	9	204	213	3,809	1,969
Denbigh	1	58	59	1,172	589
Flint	1	105	106	2,354	1,004
Glamorgan	3	83	86	1,412	517
Merioneth	—	11	11	138	82
Monmouth	1	48	49	1,100	641
Montgomery	2	15	17	305	217
Pembroke	3	90	93	1,703	1,106
Radnor	—	—	—	—	—
TOTALS	150	6,068	6,218	162,379	85,400

NOTES.—(1) *Operative periods of undertakings*: 1 year = 1,480; 2 years = 493; 3 years = 4,245. (2) *Undertakings renewed for a further period*: 1 year = 158; 2 years = 59; 3 years = 42. (3) *Undertakings not renewed at end of operative period* = 74. (4) The figures showing the number of undertakings notified during the month relate to entirely fresh undertakings, and do not include undertakings renewed for a further period. Undertakings which have been cancelled, or not renewed, are not included in the figures for previous notifications.

SCOTLAND						
Aberdeen	—	27	27	1,139	333	
Angus	—	19	19	703	251	
Argyll	—	5	5	90	83	
Ayr	—	53	53	1,953	1,595	
Banff	—	2	2	103	20	
Berwick	—	2	2	53	22	
Bute	—	—	—	—	—	
Caithness	—	—	—	—	—	
Clackmannan	—	6	6	215	160	
Dumfries	1	17	18	932	753	
Dumbarton	—	3	3	105	86	
East Lothian	—	7	7	191	100	
Fife	3	32	35	1,261	637	
Inverness	1	9	10	321	198	
Kincardine	—	5	5	231	126	
Kinross	—	4	4	77	34	
Kirkcudbright	—	16	16	951	728	
Lanark	—	21	21	760	558	
Midlothian	—	1	1	44	69	
Moray	—	—	—	—	—	
Nairn	—	1	1	14	—	
Orkney	—	—	—	—	—	
Peebles	—	5	5	93	55	
Perth	2	31	33	748	426	
Renfrew	—	9	9	384	297	
Ross-shire	—	4	4	128	72	
Roxburgh	—	—	—	—	—	
Selkirk	—	—	—	—	—	
Stirling	—	28	28	846	615	
Sutherland	1	3	4	102	64	
West Lothian	—	2	2	99	70	
Wigtown	—	30	30	2,038	1,077	
Zetland	—	—	—	—	—	
TOTALS	8	342	350	13,581	8 429	

Duration of Undertakings: 1 year, 88; 2 years, 35; 3 years 227.

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THE SULPHONAMIDES

In its notice of a recent publication on the above,* *The Pharmaceutical Journal* observes: "A complete description of the chemical, medical and pharmaceutical properties and uses of the various sulphonamides would fill several large-sized volumes. So rapid has been the growth of our knowledge of these substances during the eight years that have passed since Domagk first showed that they would prevent the development of streptococcal septicaemia in mice, that in few branches of medical science are there available such detailed records of the action and uses of chemical compounds. Even so, it is necessary to exercise the greatest care in their use, for any recommendations made to-day may have to be reviewed in the light of the result of to-morrow's research. However, it is desirable that we should at least know how we stand at the present moment, and it is possible to see the position with a high degree of clarity through the medium of a booklet recently produced for the Therapeutic Requirements Committee of the Medical Research Council by a committee of six experts in this field.

"While the general aim of the booklet has been to provide a 'summary review of the clinical indications for some of the principal sulphonamide drugs in the light of their present or potential availability in Great Britain,' a good deal more than this has been achieved. For example, the booklet begins with a brief chemical description of the nine sulphonamides which are in common use, and ends with detailed instructions (*a*) for determining the concentration of the compounds in body fluids and (*b*) for producing sterile sulphanilamide powder. Sandwiched between are notes on pharmacological action, methods of determining appropriate dosage and its regulation, followed by particulars of the treatment of specific infections. One short paragraph, headed 'Questions of Supply,' points out that sulphanilamide is plentiful and supplies of sulphapyridine and sulphacetamide are adequate, but there are limitations on the amounts of the other sulphonamides which are available. The booklet emphasises the need for avoiding the use of proprietary or brand names in ordering or prescribing these compounds—a recommendation which on behalf of chemists we can heartily endorse—but it serves a very useful purpose by setting out all the known trade names for these substances."

* "The Medical Uses of Sulphonamides." M.R.C. War Memorandum No. 10. Pp. 46. Price 9d. net. H.M. Stationery Office, 1943.

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A DISTINGUISHED AUTHORITY ON THE PRESENT SHORTCOMINGS OF THE MEDICAL PROFESSION IN THE FIELD OF PREVENTIVE MEDICINE

In a paper (*A Venture in Public Health Integration*, Oxford University Press, 6s. 6d.) read to the Health Conference of the New York Academy of Medicine, Professor Allen Freeman, professor of public health at Johns Hopkins University, draws attention to the part which medical practitioners should play in imparting to the public instruction upon preventive medicine. The private practitioner, he observes, has unique opportunities for implanting proper knowledge upon the prevention of disease on the minds of those with whom he comes in contact in the course of his daily round, but hitherto these opportunities have not been used. In the United States, the chief reason for this missing of opportunities is that few recently qualified practitioners have received as students a proper training in modern methods of disease prevention, while the ignorance of the more senior practitioners is attributed largely to scarcity of post-graduate courses in the subject. The otherwise duly qualified practitioner, he maintains, needs to be assured a better training in the principles of prevention. Medical schools ought to admit preventive medicine to first-line rank in their curricula, and establish post-graduate courses in the subject. Such measures will point the young graduate to the preventive field, his absence from which, Professor Freeman contends, is to be regarded as one of the great tragedies of present-day medicine. Professor Freeman is, however, not without hope, for "in many American medical schools the professor of preventive medicine is coming to be regarded as a really respectable member of the faculty."

An experienced veterinary worker, familiar with the trend of events in the medical and veterinary professions during the past few decades and the calls that have come to be made by the public for their services, cannot but be impressed with the above frank admission of the shortcomings of the medical profession to deal with the problems of preventive medicine. The position as revealed by Professor Freeman is exposed in a recent Annotation in the *British Medical Journal* (June 5th, p. 701). Far from perfect as the situation is in the veterinary profession, one cannot but be impressed that it is much better than in the medical profession. Designed at the outset, when the first veterinary school was created in London towards the close of the 18th century, to embrace instruction in comparative and preventive medicine in their widest sense, through misadventure veterinary education suffered the great misfortune of having of having come unduly under the influence of medical men during the first half-century of its existence, and "no progress was made." It was not until the veterinary profession itself took matters in hand, with the establishment of the Royal College of Veterinary Surgeons by Royal Charter in 1844, and further by the passing of the Veterinary Surgeons Act of 1881, which gave it the one-portal system of entry to the profession, that substantial all-round progress was made. Under such great teachers as the late Sir John M'Fadyean, instruction in pathology and the cognate subject of microbiology, which, after all, provides the foundation for a sound understanding of preventive medicine, became firmly instituted at the veterinary colleges and diffused through them by the agency of the one-portal system until, as was revealed in evidence, by the late Dr. Bulloch, before the Advisory Committee on Research into Diseases of Animals, in 1921, the training in pathology given generally at the veterinary schools was better than that at the medical schools. Though we have reason to be proud of this achievement, we have no cause for complacency, because in another fundamental subject, namely, comparative and applied physiology, we have now to admit that training was much neglected, so that in the aspect of vocational studies which embraces competence in the subjects of animal husbandry, we have been, as the last Loveday Report rightly stressed, woefully behindhand. Nevertheless, we have no cause to reproach ourselves that we are not now fully alive to the paramountcy of those aspects of endeavour to serve the public in which Professor Freeman has revealed the shortcomings of the medical profession. Commenting editorially in this journal on the recommendations of the last Loveday Report, it was urged that in the final two years, devoted to the more purely vocational studies, the three groups of studies, namely Clinical Medicine and Surgery, Preventive Medicine and Animal Husbandry, should rank equal. We cannot but think that in the United States, by its magnificent triumphs in the control and eradication of Texas fever and bovine tuberculosis, the veterinary profession has more to its credit there under the head of preventive medicine than the medical profession.

Support to this authoritative view of present shortcomings of the medical profession is conveyed in the following statements made in the recent B.M.A. memorandum of evidence on medical education: "Students should be taught the fundamental principles of health and disease rather than the diagnosis and treatment of separate diseases. A thorough knowledge of fundamental principles will produce a more understanding practitioner who will be able to absorb the advances in medical knowledge and technique as they occur during his career. Many practitioners at the present time find difficulty in keeping abreast of modern medical progress because they did not acquire a sufficient foundation in their student days. More attention should be paid in the curriculum to the maintenance of health as distinct from the treatment of disease. . ."

J. T. E.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Monday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal views of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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WILLIAM HUNTING

Sir,—Arising out of the very interesting appreciation of William Hunting published on September 18th, one or two points, I think, call for explanation. In view of the exceptionally wide field of his activities the ill-founded suggestion that Hunting could have been inherently lazy is hard to understand. That at times he badly needed rest there can be no doubt. Sitting one day after lunch at his house in Chelsea enjoying our coffee and an excellent *fine*, we were discussing, if I remember rightly, the influence of health upon character. Suddenly, fixing me with his piercing, dark eyes, Hunting said: "To look at me I don't suppose you would imagine that I have heart disease and diabetes?" I expressed my astonishment and mumbled words of sympathy. "I know it's hard," he went on quietly, "and I confess that when I first heard the verdict it gave me a shock. So I called on a friend whom I knew had for some years suffered from heart trouble and asked him what was the best thing to do about it. His advice was 'forget you have a heart.' Since then I have been trying to forget." At that time Hunting would have been about 63.

His death, I notice, has been attributed to otitis media. That may be true, although it seems strange, considering his state of health, that he should finally succumb to that complaint. Labouring under physical disabilities which would have thwarted most men, his record of achievement which fills us with admiration appears all the more remarkable.

If it be true that "it is not life that matters but the courage we bring to it," then I regard Hunting's fine effort as nothing less than heroic.

Yours faithfully,
H. A. Reid.

415, Strand, W.C.2.

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THE ANNUAL GENERAL MEETING

Sir,—At the annual general meeting of the N.V.M.A. on September 30th, I was privileged to welcome the new President and to assure him of the loyalty and support of the Society of Veterinary Practitioners. I expressed the regard in which he is held, not only by myself but by every individual member.

I wish, however, to make it perfectly clear that any views which I expressed at that meeting on other matters represented my personal opinions only and not those of the Society or necessarily those of any of the members.

Yours faithfully,
R. H. Smythe.

45, St. James's Street,
Nottingham.
October 1st, 1943.

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Professor Edward Hindle, sc.d., f.r.s., Regius Professor of Zoology at Glasgow University, has been appointed Scientific Director of the Zoological Society of London, and hopes to take up his duties in January.

DISEASES OF ANIMALS ACTS, 1894 TO 1937, AND AGRICULTURE ACT, 1937 (PART IV).

Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period	Anthrax	Foot-and-mouth	Parasitic Mange*	Sheep Scab	Swine Fever
August 16th to 31st, 1943 ...	9	—	—	5	24
Corresponding period in—					
1942 ...	16	144	—	5	18
1941 ...	7	—	1	2	29
1940 ...	28	—	—	2	256
Total Jan. 1st to Aug. 31, 1943	197	12	6	110	357
Corresponding period in—					
1942 ...	216	347	26	123	298
1941 ...	309	258	15	144	910
1940 ...	367	24	15	126	3,020

Note.—The figures for the current year are approximate only.
* Excluding outbreaks in Army Horses.

Tuberculosis (Attested Herds) Schemes

The number of Attested Herds, *i.e.*, herds officially certified as free from Tuberculosis as at August 31st, 1943, was as follows:—

England	Wales	Scotland	Total (Great Britain)
3,933	8,720	3,473	16,126